

CLAIMSWhat is claimed is:

1. A method for analyzing properties of one or more species that are labeled with fluorophores, said method comprising the steps of:

using a detector to detect a plurality of photons that are emitted in a photon stream from a species that is labeled with a fluorophore and located in a detection volume wherein each of said photons arrives at said detector at an arrival time;

determining the arrival time of each of said photons in said plurality of photons;

identifying the intervals between the arrival time of a given photon and the arrival time of other photons in said plurality of photons to thereby provide photon pair intervals that are a measure of the time between the arrival of each pair of photons in said plurality of photons;

determining the number of photons that have arrival times that are within said photon pair intervals to provide a measure of intervening photons located within said photon pair intervals; and

using said photon pair intervals and said measure of intervening photons to analyze properties of said species that are located in said detection volume.

2. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 1 wherein said species that are located in said detection volume comprise a first species labeled with a first fluorophore and a second species labeled with a second fluorophore wherein said first and second species are capable of binding to each other in said detection volume to provide a third species that is labeled with both said first and second fluorophores.

3. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 1 wherein said properties of said species that are analyzed include brightness, concentration and transit time.

-93-

4. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 2 wherein said properties of said species that are analyzed include brightness, concentration and transit time.

5. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 1 wherein at least two different plurality of photons are emitted from said detection volume in two different photon streams, said method comprising the steps of:

determining the arrival time for each of said photons in both of said plurality of photons located in said different photon streams;

identifying the intervals between the arrival time of a given photon and the arrival time of other photons in each of said plurality of photons to thereby provide photon pair intervals that are a measure of the time between the arrival of each pair of photons in each of said plurality of photons;

determining the number of photons that have arrival times that are within said photon pair intervals to provide a measure of intervening photons located within said photon pair intervals for each of said plurality of photons; and

using said photon pair intervals and said measure of intervening photons for each of said plurality of photons to analyze properties of said species that are located in said detection volume.

6. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 5 wherein said species that are located in said detection volume comprise a first species labeled with a first fluorophore and a second species labeled with a second fluorophore wherein said first and second species are capable of binding to each other in said detection volume to provide a third species that is labeled with both said first and second fluorophores.

7. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 5 wherein said properties of said species that are analyzed include brightness, concentration, coincidence and transit time.

8. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 6 wherein said properties of said species that are analyzed include brightness, concentration, coincidence and transit time.

9. In a method for analyzing properties of one or more species that are labeled with fluorophores and that are located within a detection volume where a detector is used to detect a plurality of photons that are emitted as part of a photon stream from said species, the improvement comprising:

determining the time when said photons in said plurality of photons arrive at said detector to provide an arrival time for each of said photons;

identifying the intervals between the arrival time of a given photon and the arrival time of other photons in said plurality of photons to thereby provide photon pair intervals that are a measure of the time between the arrival of each pair of photons in said plurality of photons;

determining the number of photons that have arrival times that are within said photon pair intervals to provide a measure of intervening photons located within said photon pair intervals; and

using said photon pair intervals and said measure of intervening photons to analyze properties of said one or more species that are located in said detection volume.

10. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 9 wherein said species that are located in said detection volume comprise a first species labeled with a first fluorophore and a second species labeled with a second fluorophore wherein said first and second species are capable of binding to each other in said detection volume to provide a third species that is labeled with both said first and second fluorophores.

11. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 9 wherein said properties of said species that are analyzed include brightness, concentration and transit time.

12. An improved method for analyzing properties of one or more molecules that are labeled with fluorophores according to claim 10 wherein said properties of said species that are analyzed include brightness, concentration and transit time.

13. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 9 wherein at least two different plurality of photons are emitted as part of two different photon streams from said detection volume, said improvement comprising the steps of:

determining the arrival time for each of said photons in both of said plurality of photons;

identifying the intervals between the arrival time of a given photon and the arrival time of other photons in each of said plurality photon to thereby provide photon pair intervals that are a measure of the time between the arrival of each pair of photons in each of said plurality of photons;

determining the number of photons that have arrival times that are within said photon pair intervals to provide a measure of intervening photons located within said photon pair intervals for each of said plurality of photons; and

using said photon pair intervals and said measure of intervening photons for each of said plurality of photons to analyze properties of said species that are located in said detection volume.

14. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 13 wherein said species that are located in said detection volume comprise a first species labeled with a first fluorophore and a second species labeled with a second fluorophore wherein said first and second species are capable of binding to each other in said detection volume to provide a third species that is labeled with both said first and second fluorophores.

15. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 13 wherein said properties of said species that are analyzed include brightness, concentration, coincidence and transit time.

16. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 14 wherein said properties of said species that are analyzed include brightness, concentration, coincidence and transit time.

17. A method for analyzing properties of one or more species that are labeled with fluorophores according to claim 1 wherein said step of analyzing said properties comprises forming a histogram having one axis that is a measure of said photon pair intervals and a second axis that is a measure of said intervening photons located within said photon pair intervals.

18. An improved method for analyzing properties of one or more species that are labeled with fluorophores according to claim 9 wherein said step of analyzing said properties comprises forming a histogram having one axis that is a measure of said photon pair intervals and a second axis that is a measure of said intervening photons located within said photon pair intervals.